Power System Implications of Operating Large Loads: A Summary of International and Domestic Initiatives

Objective

The purpose of this memo is to outline and put into context the international and domestic initiatives that are addressing power system implications of operating large loads, with a particular focus on data centers.[1] The focus is on initiatives occurring outside of the many activities sponsored by the Department of Energy (DOE) and its National Labs. The intent is to highlight initiatives that are either ongoing or implemented within the last few years that may shape the industry going forward. The document is organized by domestic and international initiatives, outlining relevant executive orders, State legislative actions, industry working groups, utility and independent system operator (ISO) reforms, and public-private partnerships. There are a variety of private sector activities focusing on various aspects of large load operations, such as load flexibility, which are not the focus[2] of this memo.

Domestic

White House Actions

- **America's AI Action Plan** - Released in July 2025 with direction from Executive Order (EO) 14179, the AI Action Plan establishes three pillars related to "winning the AI race" - innovation, infrastructure, and international diplomacy and security - and sets forth policy goals for near-term execution by the federal government. With respect to the electric grid, the AI Action Plan notes that "it, too, will need to be upgraded to support data centers." It specifically recommends policy actions related to the electric grid:
  - "Stabilize the grid of today as much as possible."
  - "Optimize existing grid resources as much as possible."
  - "Prioritize the interconnection of reliable, dispatchable power sources as quickly as possible and embrace new energy generation sources at the technological frontier (e.g., enhanced geothermal, nuclear fission, and nuclear fusion)."
  - "Create a strategic blueprint for navigating the complex energy landscape of the 21st century."

[1] Idaho National Laboratory (INL) would like to thank Telos Energy for their contributions to this memo and for their support of the Grid Deployment Office Large Load and Data Centers project at INL.

[2] Similarly out of scope efforts include those from multiple entities working to share data from operations or create other synthetic data sets, or provide reports on power system events involving large loads.

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- **Executive Order 14318 "Accelerating Federal Permitting of Data Center Infrastructure"** - Signed in July 2025, this EO aims to reduce regulatory barriers to deploy AI data centers. The order explicitly identifies both the data centers and related infrastructure required to build data centers, such as transmission lines and various electrical generation sources. The order further establishes a fast track to regulatory approval of data centers that meet certain criteria.
- **EO 14262 "Executive Order on Strengthening the Reliability and Security of the United States Electric Grid"** – Signed in April 2025, this EO declares a national energy emergency due to surging electricity demand, citing AI and data center growth as primary drivers. It directs the DOE to streamline emergency orders under Section 202(c) of the Federal Power Act to ensure grid reliability and requires DOE to develop a uniform methodology for assessing reserve margins and identifying regions at risk of capacity shortfalls. The order emphasizes the need for dispatchable generation and fuel-secure resources to meet growing demand.
- **Presidential Memoranda, "Executive Order on Updating Permitting Technology for the 21st Century,"** – Signed in April 2025, this action directs agencies to modernize permitting processes using digital tools. It applies to infrastructure projects including energy, transportation, and communications. It may indirectly benefit data center and grid infrastructure projects by reducing permitting delays.
- **Memorandum M-19-19, Update to Data Center Optimization Initiative (DCOI) -** contains requirements for the consolidation and optimization of Federal data centers. It establishes consolidation and optimization targets and metrics for Federal agencies, as well as requirements for reporting on their progress.

Relevant White House Actions – Not Data Center Specific

- **EO 14154 "Unleashing American Energy"** – Signed in January 2025, this EO focuses on removing regulatory barriers to domestic energy production. While it is not data center-specific, it support the energy supply needed for large scale energy infrastructure.
- **EO 14270, "Zero-Based Regulatory Budgeting to Unleash American Energy,"** – Signed in April 2025, this EO requires agencies to sunset outdated energy regulations and justify new ones. It does not directly address data centers, but it aims to reduce regulatory friction for energy infrastructure development. It could affect how utilities and developers navigate compliance for data center-related energy projects.

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State Actions

States are converging on common principles: large loads must sign long-term contracts, fund upgrades, and ensure cost causation. Many states now impose minimum billing obligations (60-85% of contracted demand) to protect utilities from stranded costs. The thresholds for these requirements vary across states, and technical standards for how curtailment is performed or how ramp rates are enforced is limited. Rapid growth of data centers is driving unprecedented policy activity, with more states expected to formalize large-load interconnection rules by 2026.

- **Texas:** Texas Senate Bill 6, signed into law in late June of 2025, requires large energy users (like data centers) to fund infrastructure upgrades, enable remote disconnection during emergencies, and register backup generators to bolster grid reliability. Developers must pay a $100,000 minimum study fee to discourage speculative requests, and they must also show proof of site control and disclose if they have also applied for service from other Texas utilities ("phantom load" prevention). Any backup generation that can cover >50% of the facility load must be disclosed, and in grid emergencies, ERCOT can direct either curtailment or activation of this backup.
- **Indiana:** Indiana Tariff Reforms - In February 2025, the Indiana Utility Regulatory Commission approved a settlement agreement on large load tariffs agreed to by utilities and many large tech companies (Amazon Data Services, Google, Microsoft, and the Data Center Coalition). The reforms require new large load customers, including data centers, to make long-term financial commitments proportional to their size, pay an exit fee if they reduce their contact capacity by more than 20 percent, and pay a minimum monthly demand charge of at least 80 percent of their contract capacity.
- **Georgia:** Georgia Public Service Commission (PSC) Docket 55378- On January 23, 2025, the Georgia PSC unanimously approved a new rule addressing the energy consumption of the state's large-load customers (loads greater than 100 MW, which are primarily hyperscale data centers). Under the new rule, these customers must pay the full cost of any transmission and distribution system upgrades needed to serve the load. All contracts between Georgia Power and large load customers must be filed with the PSC for transparency and approval, a framework which is designed to prevent smaller customers from bearing costs triggered by large data center projects.
- **West Virginia:** Signed in May 2025, the West Virginia Power Generation and Consumption Act of 2025 is designed to attract large-scale data centers by offering

regulatory exemptions, tax incentives, and energy autonomy through microgrids. The law establishes a Certified Microgrid Development Program, allowing "high-impact data centers," defined as facilities with at least 90 MW of critical IT load, to generate and consume their own power independently of state-regulated utilities. These data centers are exempt from many local zoning and permitting requirements and can operate in state-designated microgrid districts, where local governments have limited oversight. The law also removes the requirement that on-site power be renewable, enabling the use of fossil fuels like coal and natural gas. To prevent cost-shifting, regulated utilities are barred from passing microgrid-related expenses onto other ratepayers

- **Ohio:** In July 2025, the Ohio Public Utilities Commission (PUC) unanimously approved a settlement agreement between AEP Ohio and stakeholders, setting new terms and conditions for connecting data centers to the grid. Under this agreement, a tariff is applied to loads > 25 MW. Customers must sign 12-year contracts (with a minimum 4-year ramp) and maintain 85% minimum billing. Collateral and financial viability proof is required, and exit fees apply for cancellations. After this tariff was approved, a moratorium on new data center interconnections, which had been in place since 2023, was removed.
- **Utah:** The **Utah Electric Utility Amendments (S.B. 132),** signed into law on March 25, 2025, and effective May 7, 2025, establishes a new regulatory framework for large-scale energy consumers, particularly data centers and AI facilities, by allowing those with loads over 50 MW to bypass the traditional regulated utility model and instead negotiate power contracts in a competitive market. The law applies specifically within the Rocky Mountain Power service territory and aims to prevent existing ratepayers from subsidizing infrastructure upgrades for new high-demand user. It empowers the Utah Public Service Commission to oversee these arrangements and ensures that any transmission system upgrades required for new loads may still benefit the broader grid.
- **South Carolina:** The **South Carolina Energy Security Act (Act 41)** enables expedited permitting for energy infrastructure projects, including those supporting data centers, by imposing a six-month deadline for agency review, after which projects are automatically approved if no action is taken. It also grants the Public Service Commission (PSC) broad discretion to approve discounted electricity rates for data centers with loads over 50 MW and investments exceeding $100 million, without

requiring individualized cost-of-service analysis. Additionally, the PSC can declare energy emergencies to bypass standard regulatory procedures, further easing the path for data center development.

- **Tax Incentives** - As of an October 2024 survey conducted by law firm Husch Blackwell, 36 states have some kind of legislation authorizing tax incentives for new data center development. CNBC reported in June 2025 that $6 billion in exemptions have been awarded in the last five years from the 16 states who report how much they award in tax breaks.

Some states have proposed legislation which has not yet been fully approved or may have even failed to pass. While this legislation may never become law or impact the industry, it is relevant to examine the proposed laws to understand the trends and track feedback or challenges to the legislation in order to understand the direction of industry and regulation.

- **Oregan:** **Oregan House Bill 3546 (2025)**– This bill, "Relating to large energy use facilities; and declaring and emergency," or colloquially titled "Protecting Oregonians With Energy Responsibility (POWER)," directs the PUC to provide classification of service for large energy use facilities, which will likely result in higher rates for these customers. Large energy users, defined as >20 MW, must sign long-term contracts (at least 10 years) with utility companies to help ensure customers pay a larger share of energy infrastructure investments. Another bill, SB 553, would require the Oregon Department of Energy to study data center power usage and report its findings by September 2026.
- **California:** **California Senate Bill (SB) 57 (pending 2025)–** This bill, known as the "Ratepayer and Technological Innovation Protection Act," directs the California PUC to create a large load tariff requiring data centers to fund full upgrade costs and grants priority in interconnection requests to zero-carbon projects.
- **New York:** The **New York State Sustainable Data Centers Act**, introduced as **Assembly Bill 9086** and **Senate Bill 6394**, proposes a comprehensive regulatory framework to align data center energy use with the state's climate goals. The legislation would mandate that data centers consuming 5 MW or more submit detailed annual disclosure reports on energy and water use, emissions, labor demographics, and waste heat recovery. It prohibits utilities from offering incentives for fossil fuel-based power purchase agreements and requires a phased transition to 100% renewable energy by 2040 through direct power purchase agreements. The bills also empower the Public Service Commission to impose fines for noncompliance, establish energy efficiency

benchmarks, and implement a community discount plan—funded by data center operators—to offset rising utility costs for low- and moderate-income residents in host communities.

- **Virginia:** On January 14, 2025, state legislators introduced a bipartisan package of five bills aimed at protecting the environment and consumers in response to the dramatic rise of data center deployments in the state. Four bills failed in committee the fifth was vetoed by the governor[3]. Concerns of de-incentivizing the data center and limiting local discretion seemed to be key concerns about the bills.
- **Illinois:** Illinois Senate Bill 94 (SB 94), titled the Data Center Construction by Foreign Adversaries Act, proposes a regulatory framework restricting the development of data centers by foreign-owned entities. The bill prohibits any company that is at least 51% owned by, or headquartered in, a country designated as a "foreign adversary" from constructing a data center in Illinois unless a joint study is conducted by the Illinois Commerce Commission, Illinois Power Agency, and Department of Commerce and Economic Opportunity. This study must certify that the proposed data center's energy use constitutes a new, self-generated load that does not impact the existing load supply of PJM or MISO. SB 94 is pending in the Senate Assignments Committee after being introduced on January 17, 2025, and last acted upon on April 3, 2025, when additional co-sponsors were added.

Working Groups

- ESIG LL TF - In December 2024, ESIG launched a Large Loads Task Force (LLTF) to "unite stakeholders, identify practical solutions, and develop harmonized practices that ensure reliable and efficient grid integration while supporting industry growth." The LLTF is made up of eight specialized project teams focusing on:
  - Large Load Data Collection
  - Load Forecasting
  - Interconnection Process
  - Interconnection Requirements
  - Modeling

[3] https://www.techpolicy.press/virginia-lawmakers-and-communities-face-uphill-battle-to-regulate-data-centers-as-industry-booms/

  - Market Aspects
  - Transmission Planning
  - Resource Adequacy Aspects
- **NERC Large Loads Task Force** - The purpose of the Large Loads Task Force (LLTF), launched in October 2024, is to better understand the reliability impact(s) of emerging large loads such as Data Centers (including crypto and AI), Hydrogen Fuel Plants, etc. and their impact on the bulk power system (BPS). In July 2025, the LLTF released a whitepaper on "Characteristics and Risks of Emerging Large Loads" and has a work plan to continue prioritizing these risks, and to identify gaps and mitigation measures.
- **EPRI DCFlex** - Launched in late 2024, EPRI's DCFlex initiative "aims to demonstrate how data centers can support and stabilize the electric grid while improving interconnection and efficiency."
- **EPRI Open Power AI Consortium** - Launched in early 2025, the consortium aims to "evolve the electric sector by leveraging advanced AI technologies to innovate the way electricity is made, moved, and used." The efforts key objectives include to "develop and maintain datasets, open-source libraries, AI accelerators, and AI/Gen AI models."
- **ERCOT Large Load Working Group** - LLWG is responsible for developing and recommending policies to facilitate the reliable and efficient integration of Large Loads into the ERCOT system. LLWG's work covers a range of technical and market issues, including planning, operations, and market-related processes for Large Load interconnection and management.
- **National Association of Regulatory Utility Commissioners (NARUC)–National Association of State Energy Officials (NASEO) Task Force on Comprehensive Electricity Planning** – This task force, started in 2018 and running for two years, was intended to help NARUC and NASEO members to develop new approaches that better align distribution system planning and resource planning processes.
- **NASEM: National Academics on Science, Engineering and Medicine** held a workshop "Implications of Artificial Intelligence-Related Data Center Electricity Use and Emissions", in November 2024. The proceedings from the workshop published this year describe AI datacenter stakeholders' take on technical, as well as social, behavioral, and environmental impacts, knowledge gaps and future directions.

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ISO/RTO and Utility Efforts

- **SPP High Impact Large Loads (HILL)** - SPP and its members are taking action to enable the timely and reliable integration of High Impact Large Loads (HILL) through more efficient, scalable processes that provide improved timing and cost clarity to transmission customers. Their goal is to provide a 90-day path to interconnection agreements under certain conditions, and in parallel with existing paths to long-term firm service. Conditional High Impact Large Load (CHILL) is a new service offering - still in development as of July 2025 - for large-load customers which provides the fastest path to interconnection, with the trade-off of potential temporary curtailments to protect system reliability.
- **MISO Expedited Resource Addition Study (ERAS) process** - In August 2025, MISO launched its first cycle of ERAS, a temporary process designed to bring new power generation online quickly enough to meet growing demand. The projects studied in the first cycle span all three regions of MISO, and some directly support data center interconnections and large spot loads.
- **PJM Critical Issue Fast Path Process on Large Load Additions** - In August 2025, PJM launched a stakeholder process to address the development of reliability-focused solutions to ensure large load additions can continue to be integrated rapidly and reliably, without causing resource inadequacy. The goal of the effort is to design a program to be filed with FERC by December 2025. The initial focus of the effort centers on “non-capacity-backed load” - a service arrangement wherein large loads would be curtailed before the grid operator moves to pre-emergency load curtailments for other electricity users. In exchange, the loads would receive capacity cost savings.
- **Indiana-Michigan Power & Google Agreement** - I&M and Google signed an agreement for a special demand response program for Google Data Centers.

International Efforts

- **IEEE Open Data Center Initiative** - The Open Data Center Initiative (ODCI) aims to bring together stakeholders in the field of global data centers to discuss the latest advances in data center technology, challenges, and future development trends, and to promote the formation of an industry consensus. Among the group’s purposes and objectives are to promote technological innovation and convergence, while also building industry standards.

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- **Power Usage Effectiveness (PUE) standard ISO/IEC 30134-2:** - Originally introduced in 2006, the PUE metric has since been adopted by ISO/IEC and has become the most commonly used metric for reporting the energy efficiency of data centers.
- **ASHRAE's Equipment Thermal Guidelines for Data Processing** - Updated in 2021, these guidelines set the recommended server inlet temperature range for data centers at 18-27°C (64.4° to 80.6°F) and recommend humidity levels. These guidelines also define different classes of data centers and specify "allowable" environment specifications for air cooling.
- **EU Code of Conduct for Data Centers**- This voluntary initiative encourages data center operators and owners to adopt best practices that reduce energy consumption and promote sustainability in the EU. The Code of Conduct emphasizes PUE and other efficiency improvements. More recently, a companion best practices document was released that contains a full list of the identified and recognized data center energy efficiency best practices within the Code of Conduct.
- **Ireland's Large Energy Users Connection Policy**- Ireland's Commission for Regulation of Utilities (CRU) proposed a decision in February 2025 that would provide a pathway to new data center connections after data centers development in the country had stalled for years facing grid constraints. The proposal would require new data centers to have onsite generation/storage capacity to match the requested data center demand. This generation/storage will be required to participate in the electricity market and support overall system adequacy. System Operators will also be required to regularly publish location constraints on interconnection.
- **IEEE Industry Technical Support Leadership Committee (ITSLC) –** Task Force on Data Center Growth and Grid Readiness, published "Data Center Growth and Grid Readiness" technical report. The report describes power sector issues on load forecast, resource adequacy, interconnections, and operations around the anticipated rapid load growth.